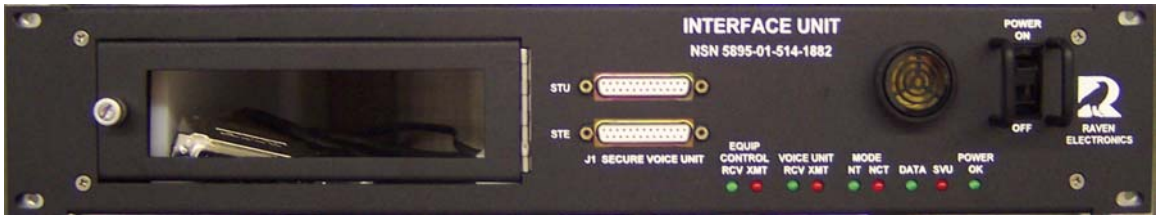
Raven Electronics Corporation

Raven 41700-777

Interface Unit



Users Manual

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CHAPTER 1 INTRODUCTION

General Information

Thank you for purchasing the 41700-777 Interface Unit (IU) Shelf from Raven Electronics Corporation. Please contact us if you have any questions, concerns, product ideas, or ideas to improve this manual. We can be contacted at:

Raven Electronics Corporation
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Safety Warning

Please be Electro-Static Discharge (ESD) protected before starting any procedures contained in this manual.

Raven Electronics' Warranty

This warranty expressly precludes any liability by Raven for consequential damages however arising after delivery to the purchaser of the affected equipment, and is limited to the expressed warranty, excluding all implied warranties including merchantability. All equipment manufactured by Raven is warranted against defective materials and workmanship for a period of two (2) years from the date of delivery to the original purchaser or end-user. Liability under this warranty is limited to servicing, adjusting, repairing or replacing, as necessary, any equipment returned to the factory, transportation prepaid for that purpose. Factory examination must disclose a manufacturing defect. Repaired or replaced items will be returned to the purchaser surface freight prepaid within the continental U.S.A.

This warranty does not extend to any equipment which has been subjected to transportation damage, misuse, neglect, accident, improper installation, or any other circumstances reasonably beyond the control of Raven. Beyond the warranty period, repairs will be billed to the purchaser at cost. In such cases, an estimate will be submitted for approval before repair is initiated. Repaired equipment will be returned to the purchaser with transportation charges collect, unless agreed to between the purchaser and Raven.

CHAPTER 1 INTRODUCTION

System Description

The 41700-777 Interface Unit is a standard 19" rack mountable unit which provides a common point for connecting various hardware elements, signaling protocol converters, Secure Voice Unit, modem(s), and housing for a COMSEC device. The IU contains signal switching and level conversion printed circuit boards, and power supply. The Unit will support a Network Terminal (NT) configuration or a Network Control Terminal (NCT) configuration, selected by a rear panel switch.

Front panel indicator lights display the operational status of each internal modular component, NT/NCT operation selection, current data path that interfaces with J2 (the primary modem connection), and the power supply.

Note: The KIV-7 is not included within the Interface Unit. The COMSEC device must be manually installed prior to system operation.

The Unit operates on standard AC power sources of 85 to 264 VAC, 50 to 60 Hz. The Unit provides 12 VDC power to a rear panel connector and power for the COMSEC Unit contained within the Unit.

CHAPTER 2 INSTALLING and SETTING UP THE INTERFACE UNIT

Equipment Needed for Installation

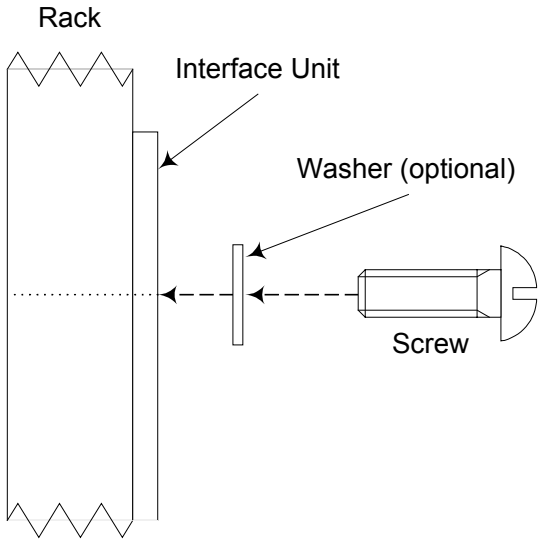
Rackmount Equipment (to install unit in a rack):

- Screws
- Washers (optional)

Mounting Unit in Rack

Please note, Raven supplies the hardware for the mounting on the chassis, but not on the rack. The flanges included with your Interface Unit (IU) Shelf are for 19"racks.

1. Hold unit in place in the rack.
2. Place a washer and screw in one of the four holes and tighten it to the rack. *(Please refer to the picture below.)*
3. Repeat Step 2 until all four screws are in place.



CHAPTER 2 INSTALLING and SETTING UP THE INTERFACE UNIT

Equipment Setup

The Interface Unit enclosure contains the necessary hardware to properly interface the ports of the PC/Controller, Secure Voice Unit, Down Converters (if in NCT/ANCT configuration), and modems. All interface connections to external equipment, except for the Secure Voice Unit, are mounted on the back panel. The Interface Unit also provides the housing for an audio alarm.

Warning: *This device has High Voltage. Make sure to disconnect the power cord before servicing the unit. Failure to do so may result in physical injury due to electrical shock.*

Note: *The Interface Unit contains a Mode Switch at the back of the Interface Unit that allows the operator to switch between NT and NCT Modes. The Mode Switch is the only device within the Interface Unit that can be manipulated by the operator.*

J1 – Secure Voice Interface

- The Unit supports full duplex RS-232 specification signals for transmit and receive data on J1. In addition, transmit and receive clocks are provided at half the modem-provided clock frequency. In the NT application, data is connected to the primary modem when the "A / B" switch is in the "B" position and the primary modem provides transmit and receive clocks. In the NCT application, data is connected to the secondary modem (J3) and the secondary modem provides transmit and receive clocks.

J2 – Primary Modem Data Port

- The Unit supports full duplex RS-422 specification signals for transmit and receive data on J2. In addition, the Unit expects to receive transmit and receive clocks of 9600 Hz from the modem with RS-422 specification signals.

J3 – Secondary Modem Data Port

- The Unit supports full duplex RS-422 specification signals for transmit and receive data on J3. In addition, the Unit expects to receive transmit and receive clocks of 9600 Hz from the modem with RS-422 specification signals.

J4 – Modem Control Data Port (PC)

- The Unit supports full duplex RS-232 specification signals for transmit and receive modem control signals on J4. Any baud rate may be used on this port. In addition, the Alarm Horn and the COMSEC / Secure Voice data source switch ("A / B" switch) are controlled by RS-232 specification signals on this connector.

J5 – Hardware Control Bus Port (Modem and/or U/D Converter)

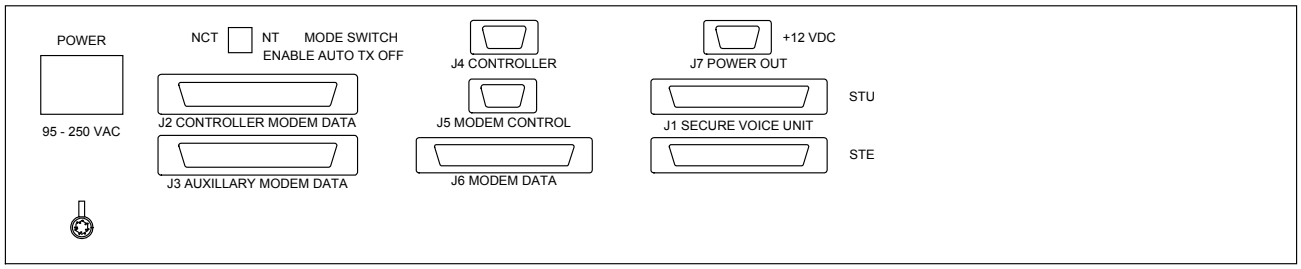
- The Unit supports full duplex RS-485 specification signals for transmit and receive modem control signals on J5. The port is designed as a 4-wire port (separate transmit and receive wires) but may be connected as a 2-wire port (transmit and receive wires connected together), since the transmit buffer is tri-stated when it is not transmitting. Any baud rate may be used on this port.

J6 – Primary Data Port (PC)

- The Unit passes signals on this port directly to the COMSEC device Red connector. The signals are full duplex RS-232 specification signals. The COMSEC device Black connector is connected to J2 when the "A / B" switch (controlled by the device connected to J4) is in the "A" position.

J7 – DC Power

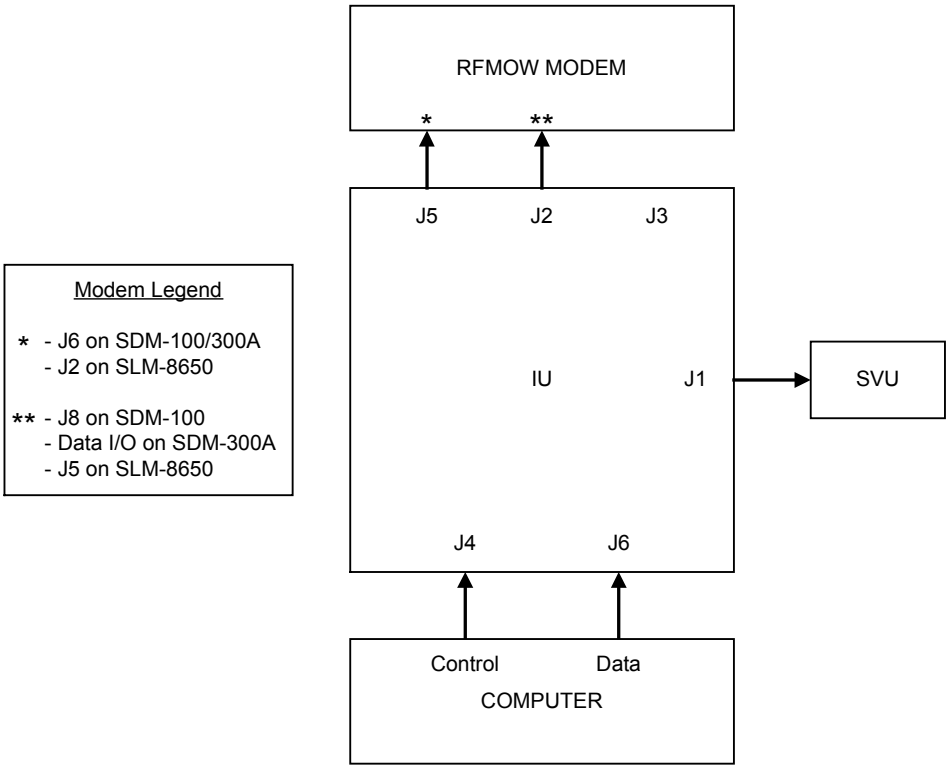
- The Unit supplies +12 VDC power to this connector for external use. Current drain is limited to 1 Amp.



NT Configuration

In the NT configuration, the Mode Switch at the back of the Interface Unit must be put in the NT position. The interconnections between the Interface Unit and the RFMOW system must be made as follows:

1. Remove the dust cover before inserting the COMSEC device.
2. The COMSEC device interface cables within the Interface Unit must be connected to the KIV-7.
3. The PC/Controller COM ports must be connected to the Interface Unit ports J4 and J6.
4. The Secure Voice Unit (SVU) is connected to the Interface Unit via J1 on the front or rear panel of the Interface Unit. Depending on the type of the SVU, the appropriate connector on the Interface Unit must be used (i.e., STU-III or STE (Tactical) connector interface).
5. The interconnection between the Control Modem and the Interface Unit is made via the J2 and J5 connectors on the Interface Unit.



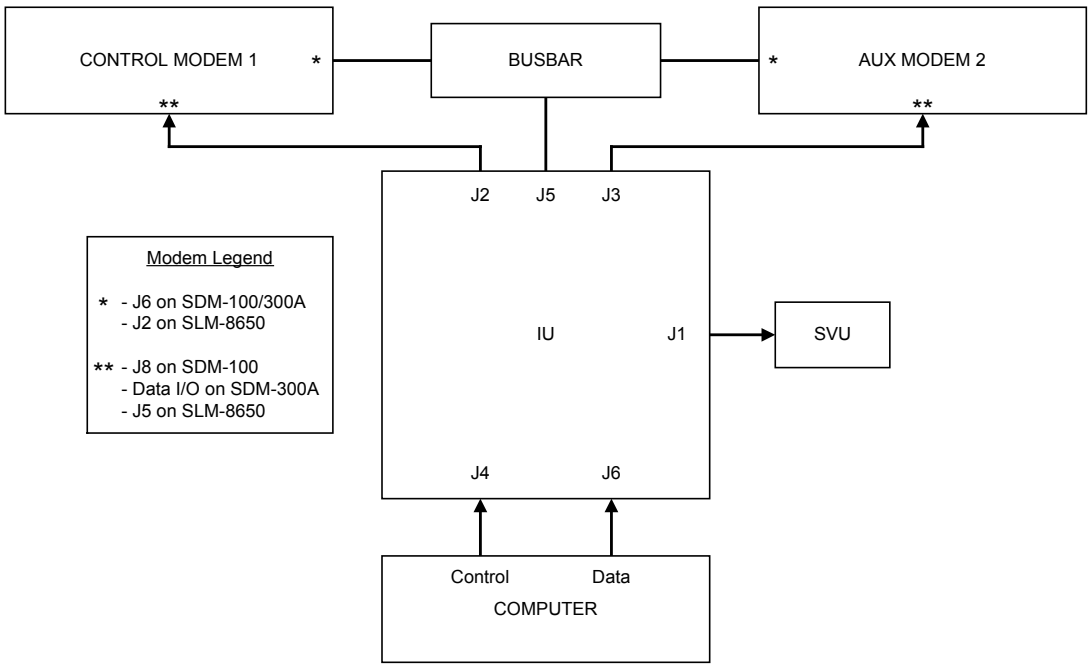
CHAPTER 2 INSTALLING and SETTING UP THE INTERFACE UNIT

NCT/ANCT Configuration

In the NCT/ANCT configuration, the Mode Switch at the back of the Interface Unit must be put in the NCT position. The interconnections between the Interface Unit and the RFMOW system must be made as follows:

1. Remove the dust cover before inserting the COMSEC device.
2. The COMSEC device interface cables within the Interface Unit must be connected to the KIV-7.
3. The PC/Controller COM ports must be connected to the Interface Unit ports J4 and J6.
4. The Secure Voice Unit (SVU) is connected to the Interface Unit via J1 on the front or rear panel of the Interface Unit. Depending on the type of the SVU, the appropriate connector or the Interface Unit must be used (i.e., STU-III or STE (Tactical) connector interface).
5. The data interconnection between the Control Modem and the Interface Unit is made via the J2 connector on the Interface Unit.
6. The data interconnection between the Auxiliary Modem and the Interface Unit is made via the J3 connector on the Interface Unit.
7. The control interconnection between the Bus Bar and the Interface Unit is made via the J5 connector on the Interface Unit.

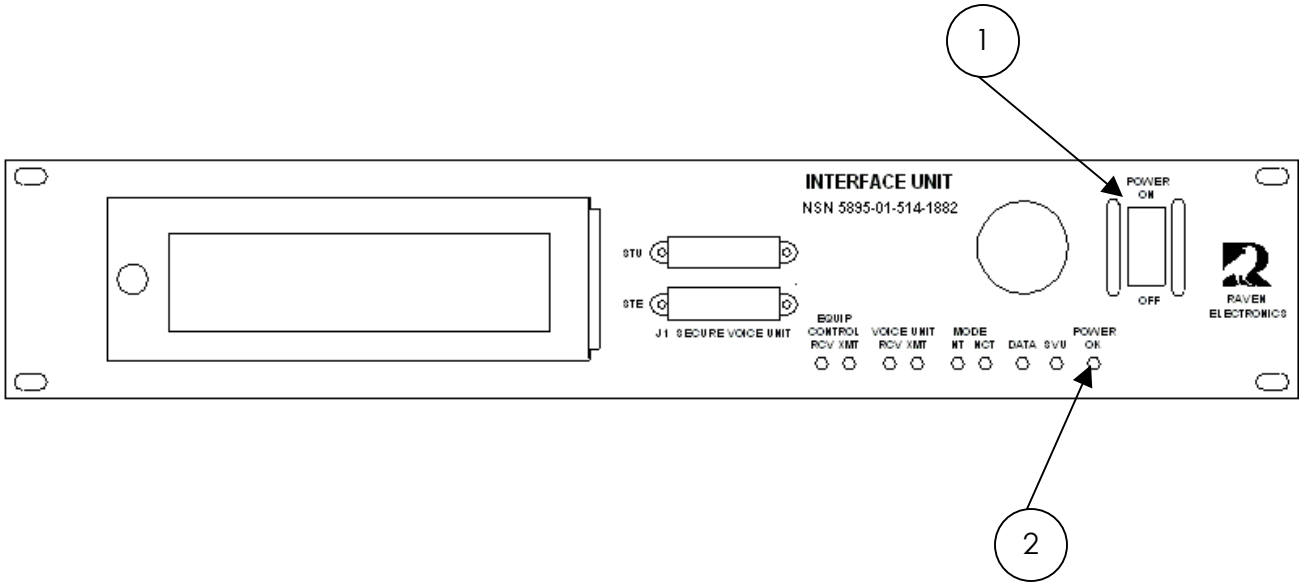
Note: *The cable from the Interface Unit must be plugged into the Source Connector on the Bus Bar.*



Powering Up the Interface Unit

Insert COMSEC device and be sure it is firmly in place before performing the following steps.

1. Press the power button to ON. This switch is located on the front panel.
2. The Power LED (green light) on the front panel should be illuminated. If not, please refer to Chapter 5, Troubleshooting.



Operating the Interface Unit

The 41700-777 acts as a data-switching and control device between various peripherals to include a controller computer, satellite modem(s), secure voice unit, or other devices. Switching is controlled by software that is installed on a controller computer. Raven Electronics can provide some code (written in Visual Basic) that demonstrates this software control described below.

Device Control
The J5 connector on the rear of the IU is the Controller interface. The IU performance specification calls for this interface to be RS-485 and have the ability to operate in four or two-wire mode. RS-485 is a true multi-point communications standard that specifies up to 32 devices on a single cable. Up to 32 modems and/or other devices can be attached to the RS-485 port on J5 of the Interface Unit. The controller computer can utilize the J4 port on the Interface Unit to control these attached devices. The Interface Unit acts as a RS-232 to RS-485 converter for the purpose of controlling external devices.

"A / B" Switch Operation
In the NT mode of operation it is necessary to control the Interface Unit to switch between the voice and data paths. In order to control the "A / B" switch on the Interface Unit, a computer communications port must be connected to J4 (usually COM2). To switch from data to voice mode, the computer must assert the DTR line of the communications port. De-asserting DTR will return the Interface Unit to data mode.

Sonalert Operation
Some applications require that a user be alerted by an alarm when a message is received from the NCT. The Interface Unit can accomplish this with the help of software control. As in the case with "A / B" switch operation, a communications port on the controller computer needs to be connected to J4 of the Interface Unit. Asserting the RTS pin on the communications port can enable the Interface Unit's sonalert. To turn the sonalert off, simple de-assert the RTS pin.

Operating the Interface Unit (cont.)

Data Communications
Data communications occurs through the use of terminal software that utilizes a communications port on the controller computer. This is typically done by connecting J6 on the Interface Unit to one of the controller computer's communications ports (usually COM1). For data communications to occur in the NT mode of operation, DTR must not be asserted. In NCT mode, J2 is used exclusively for data communications and operation of the "A / B" switch is not necessary.

Users will also be required to install a COMSEC device into the Interface Unit to complete the data path. A synchronous RS-422 to RS-232 converter can also be used in place of the KIV-7, but all data communications will be in the clear.

Voice Communications
Voice communication occurs by installing a Secure Telephone device (STU or STE III) at J1 on the front or back of the Interface Unit. If the system is in NT mode, DTR must be asserted in order for the Interface Unit to select the voice path on the "A / B" switch. In NCT mode, J3 is used exclusively for voice communications and operation of the "A / B" switch is not necessary.

Secure Telephone devices include built-in COMSEC so additional crypto devices are not necessary.

For pin assignments, please refer to Table B: Connectors.

NT / NCT Switch
This switch controls the Interface Unit mode of operation. If this switch is in the NCT position, the "A / B" switch is disabled. In the NT position, the "A / B" switch is enabled. See Chapter 2 for more details.

Enable Auto TX off Switch
The "Auto TX off" switch is a proprietary feature and ***must be disabled*** during normal operation.

CHAPTER 5 TROUBLESHOOTING

Troubleshooting

Fault	Probably Cause	Maintenance Task
Will not power up	Loose or disconnected input cables	Check Input Cables
Power LED won't illuminate	1. Power cable is not plugged in. 2. Power switch is in OFF position.	1. Check Power cable 2. Push Power switch into ON position.
SVU LED won't illuminate	Loose or disconnected J1 cable	Check J1 Cable
Data LED won't illuminate	Control Port stuck in "B" position.	Check Controller/CPU
NT/NCT mode lights	Switched to incorrect setting	Check mode switch on the rear panel
Voice Unit RCV/XMT LEDs	1. Loose or disconnected J1 cable 2. Loose or disconnected J2 cable	1. Check J1 Cable 2. Check J2 Cable
Equip Control RCV/XMT LEDs	1. Loose or disconnected J4 cable 2. Loose or disconnected J5 cable	1. Check J4 Cable 2. Check J5 Cable
Sonalert won't sound	Loose or disconnected J4 cable	Check J4 Cable

Specifications

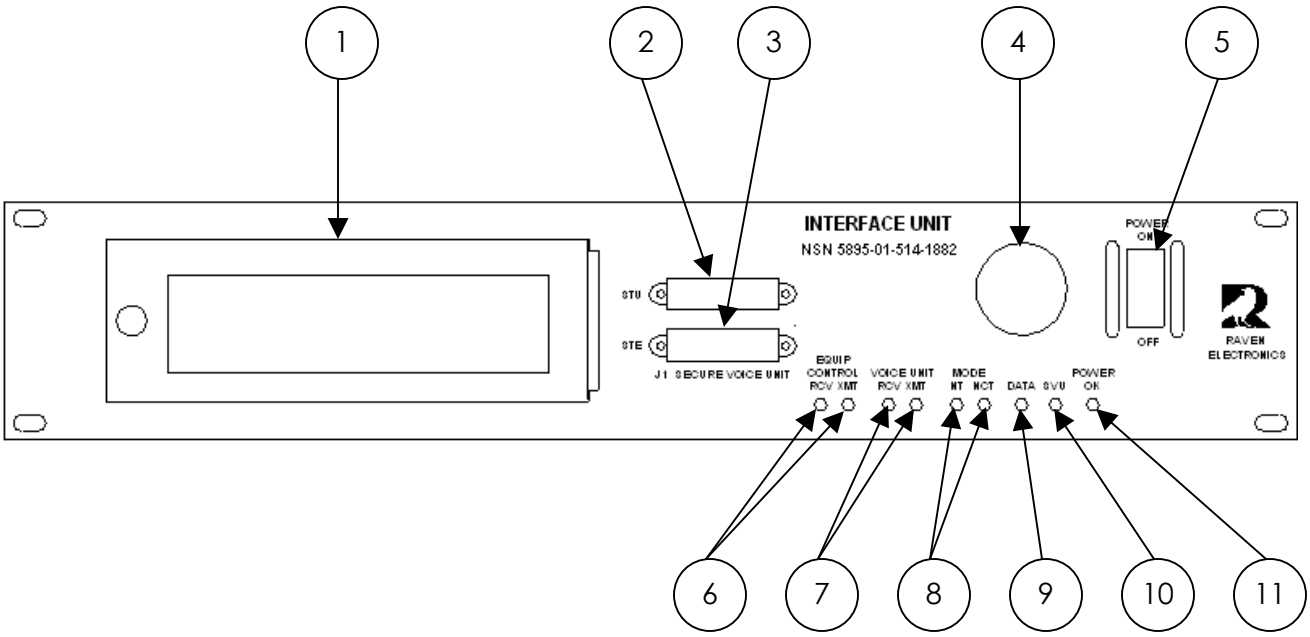
41700-777 Interface Unit

Electrical Data	
Characteristics	Value
Input Power	85 – 264 VAC, 50 to 60 Hz
Output Power (COMSEC Device)	5 VDC
Output Power (J7 – Fan)	12 VDC

Physical Data			
Characteristics		Standard	Metric
Measurements:	Width	17.125 inches	43.50 cm
	Depth	11.125 inches	28.56 cm
	Height	3.500 inches	8.89 cm
Weight		14 lbs.	6.35 kg

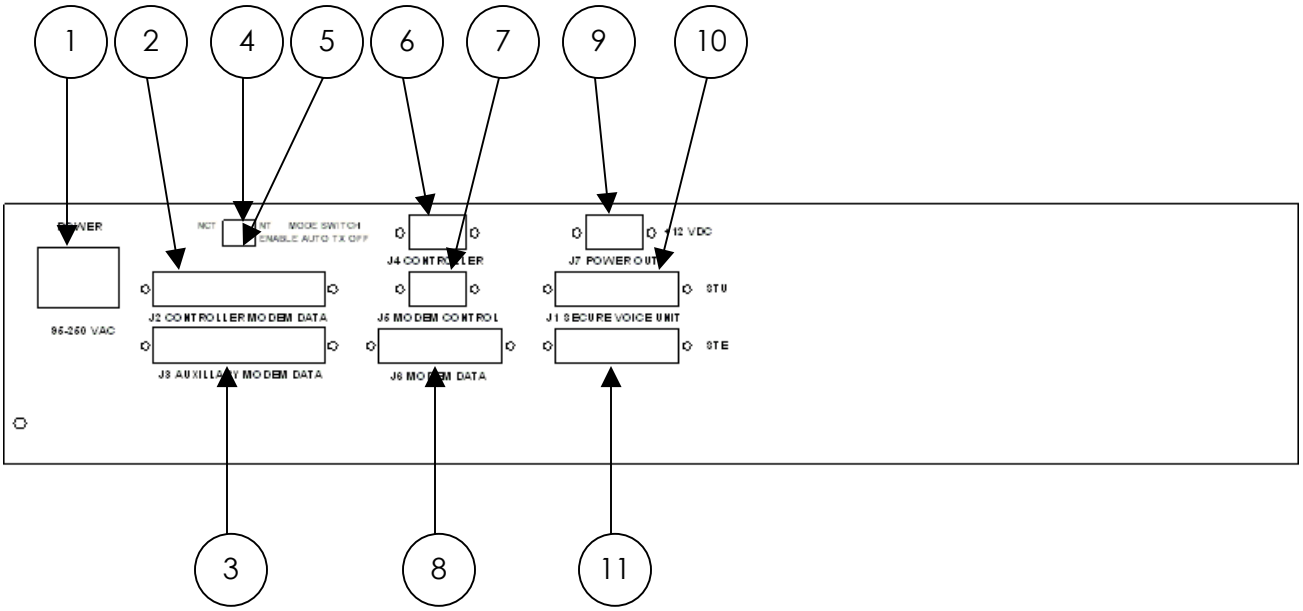
Environmental Data		
Characteristics		Value
Temperature (Ambient)	Non-Operating	-40°C to 60°C (-40°F to 140°F)
	Operating	0°C to 40°C (32°F to 104°F)
Relative Humidity	Non-Operating	10 to 90% Non-Condensing
	Operating	10 to 90% Non-Condensing
Altitude	Non-Operating	To 15,000 ft. above mean sea level
	Operating	To 10,000 ft. above mean sea level
Shock and Vibration	Non-Operating	As encountered during normal equipment transport by common carrier as secured cargo by land, sea, or air, and as encountered during tactical off-road movement
	Operating	As encountered during normal operator maintenance

41700-777 Front Panel Diagram



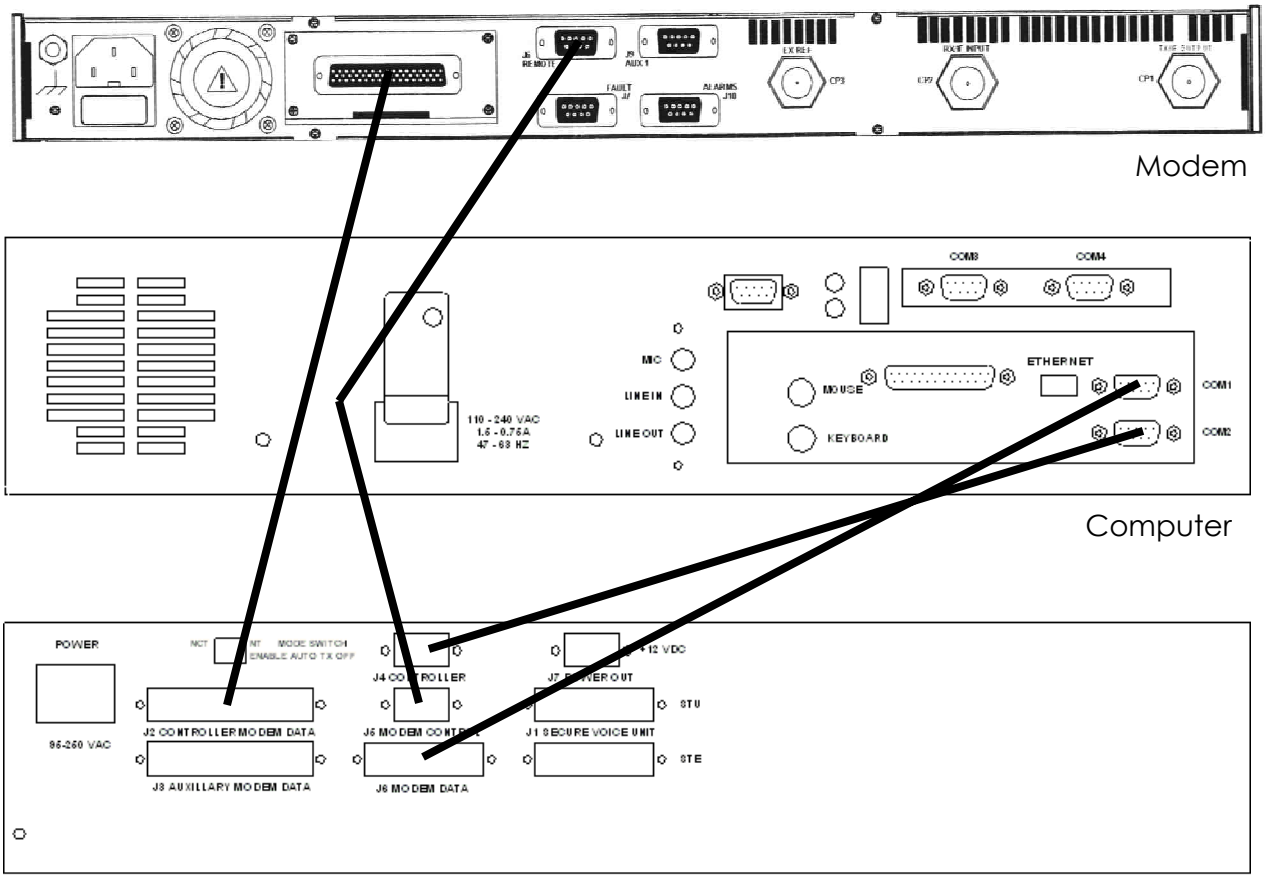
Interface Unit Front Panel	
ITEM	COMPONENT
1	Housing Enclosure for the KIV-7 Device
2	J1 Connector for the STU
3	J1 Connector for the STE
4	Alarm Sonalert
5	Power On Switch
6	Equipment Control RCV and XMT Status LEDs
7	Voice Unit RCV and XMT Status LEDs
8	NT and NCT Mode LEDs
9	Data Status LED
10	SVU Status LED
11	Power On Status LED

41700-777 Rear Panel Diagram



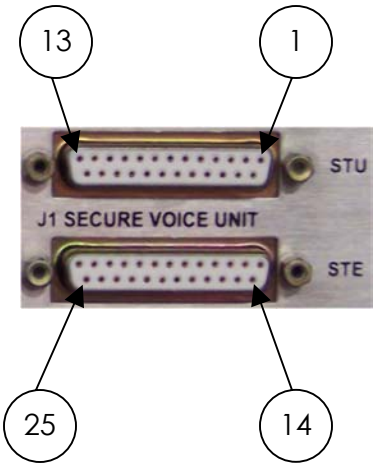
Interface Unit Rear Panel	
ITEM	COMPONENT
1	AC Power Connector
2	J2 Controller Modem Data Connector
3	J3 Auxiliary Modem Data Connector
4	NCT / NT Mode Switch
5	Enable Auto TX Off Switch
6	J4 Controller Connector
7	J5 Modem Control Connector
8	J6 Controller Data Connector
9	J7 +12 VDC Power Out Connector
10	J1 STU (Secure Voice Unit) Connector
11	J1 STE (Secure Voice Unit) Connector

Wiring Diagram



Note: *This wiring diagram is a typical configuration, but may vary depending on the type of Modem, Computer, Monitor, Keyboard, etc. used.*

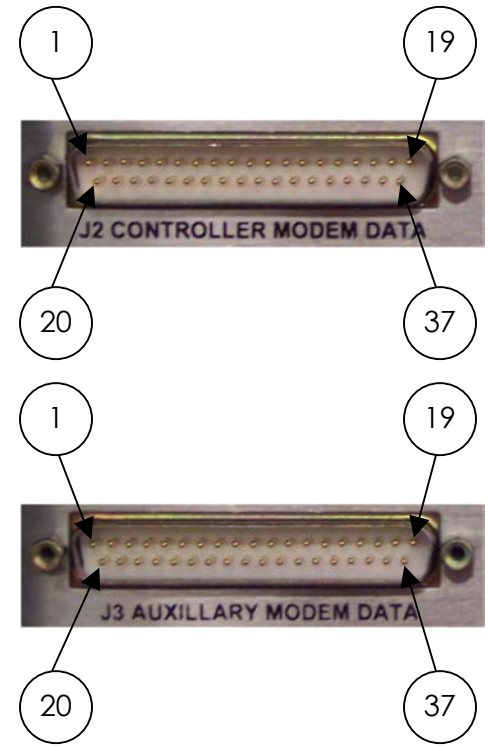
41700-777 Connectors (Pin Outs)



J1 – STE Telephone Connector (Female 25 pin D-Sub)	
Pin	Description
2	RS-232 Data FROM the STE Phone
3	RS-232 Data TO the STE Phone
4	+12 V
5	+12 V
6	+12 V
7	Ground
8	+12 V
15	4800 Hz Clock (Transmit Clock)
17	4800 Hz Clock (Receive Clock)

The clock is provided by the modem.

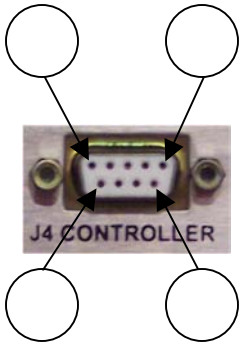
The pin-outs for the STU have the same connections, except that pins 4, 5, 6, and 8 are not +12 V.



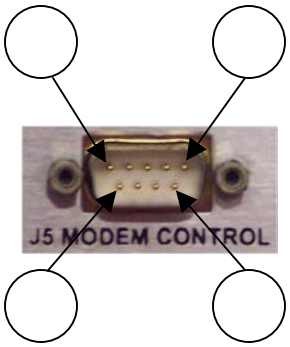
J2 & J3 Primary and Secondary Modem Data Path Connectors (Male 37 pin D-Sub)	
Pin	Description
4	RS-422 Data – TO the Modem
5	RS-422 Clock – FROM the Modem (Transmit)
6	RS-422 Data – FROM the Modem
8	RS-422 Clock – FROM the Modem (Receive)
22	RS-422 Data + TO the Modem
23	RS-422 Clock + FROM the Modem (Transmit)
24	RS-422 Data + FROM the Modem
26	RS-422 Clock + FROM the Modem (Receive)

If the KIV is required to be the clock source for Transmit, other connections are necessary.

41700-777 Connectors (Pin Outs) (cont.)



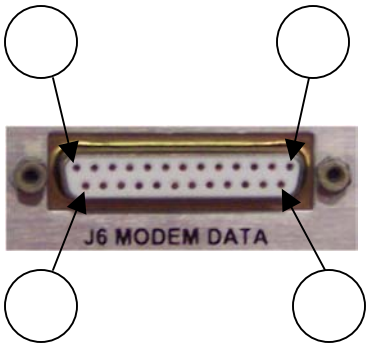
J4 – PC Control Signals Connector (Female 9 pin D-Sub)	
Pin	Description
1	RS-232 Telephone OFF HOOK signal Hi = off hook, Low = on hook
2	RS-232 Control Signal to PC Used to confirm controls from the Modem
3	RS-232 Control Signal from the PC Used to control the Modem or other Equip. on Bus
4	RS-232 Control Signal for the "A / B" Switch Hi = voice from the STE, Lo = Data from the PC transmitted to and received from the Modem Data Port
7	RS-232 Control Signal for the IU Alarm Horn Hi = Horn On, Lo = Horn Off *The front panel alarm horn sounds continuously when this signal is high.*



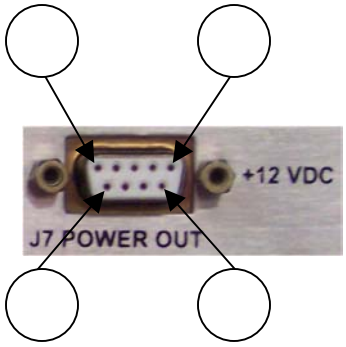
J5 – Control Signals to the Modem (Male 9 pin D-Sub)	
Pin	Description
1	Ground
4	RS-485 Signal + TO the Modem
5	RS-485 Signal – TO the Modem
8	RS-485 Signal + FROM the Modem
9	RS-485 Signal – FROM the Modem

This port is a 4-wire port, however, the transmit portion is only turned on when the port is actually sending control signals out. Therefore, it can be wired as a 2-wire port with pins 4 and 8 connected together and pins 5 and 9 connected together. The equipment connected to it would also have to be 2-wire.

41700-777 Connectors (Pin Outs) (cont.)



J6 – Data From / To the PC (Female 25 pin D-Sub)	
Pin	Description
2	RS-232 Data FROM the PC TO the COMSEC Device
3	RS-232 Data TO the PC FROM the COMSEC Device
5	RS-232 Red Alarm Indicator from the COMSEC Device
6	RS-232 Black Alarm Indicator from the COMSEC Device
7	Ground
20	RS-232 Sync Command Transmit / Receive to the COMSEC Device



J7 – Optional Power for External Equipment (If Needed) (Female 9 pin D-Sub)	
Pin	Description
1	+12 VDC up to 1 Amp current draw
2	+12 VDC up to 1 Amp current draw
3	+12 VDC up to 1 Amp current draw
4	+12 VDC up to 1 Amp current draw
5	Ground
6	Ground
7	Ground
8	Ground
9	Ground

General Conditions of Sales

RAVEN ELECTRONICS CORPORATION
400 EDISON WAY, RENO, NEVADA 89502
TELEPHONE 775-858-2400 FAX: 775-858-2410

1. CONTRACT – The following general conditions of sale apply to this contract and all purchases from Raven Electronics Corporation (hereinafter referred to as Raven). No changes, deletions or additions shall be binding on Raven, unless expressly agreed to in writing and signed by an authorized representative of Raven. Any terms or condition of the Purchaser inconsistent herewith, or in addition hereto, shall be of no force and effect, and Purchasers order shall be governed only by terms and conditions appearing herein. A definite and reasonable expression of acceptance or a written confirmation, which is sent within the time specified in the Raven proposal or sales order, operates as an acceptance of the terms specified herein, even though it states terms different from or additional to those specified herein.

2. PROPOSALS – Raven proposals, when accepted, and any subsequent orders placed as a result of such proposals, are not subject to cancellation changes, reduction in amount or suspension of deliveries except with Raven's written consent and upon terms which indemnify Raven against loss. Information contained in Raven's proposal is valid for a period of sixty (60) days from the date of proposal, unless specified to the contrary in the proposal. Stenographic and clerical errors are subject to correction. Verbal quotations expire, unless accepted, the same day they are made.

3. PRICES (are in United States dollars) – All prices and discounts are subject to change without notice. In the event of price change, the price of equipment on order but not shipped will be the price in effect at the time of acceptance of the order. Equipment already shipped is not subject to a price change. In addition to prices specified herein, purchaser shall pay for all extra components, parts, equipment, materials or services (each or all hereafter called "equipment") requested by the purchaser or made necessary by incompleteness of or inaccuracy in plans, specifications, or other information submitted by the purchaser.

4. TAXES AND TRANSPORTATION – Unless otherwise specified, the prices do not include any applicable taxes (sales, use, ad valorem, property, etc.) for the sale, use, licenses, or delivery of the equipment, software, or services supplied. The purchaser agrees to pay all taxes, licenses and transportation charges.

5. TERMS OF PAYMENT – Terms of payment to Purchasers of satisfactory credit is thirty (30) days from the date of shipment. The same terms are applicable to partial shipment. If in the judgment of Raven, the financial conditions of the Purchaser at any time does not justify continuance of production or shipment on the terms of payment specified, the company may require full or partial payment in advance before shipment. Raven may ship the equipment in installments, and pro rata payments of purchase price are due as shipments are made. If shipments are delayed by Purchaser, payments shall be made based on the contract price and percent completed. Delinquent charges of 1½% per month (18% per annum) will be added to all past due invoices.

6. DELIVERY – Raven shall not be liable for any damages or penalty for delays in delivery and/or completion due to acts of God, acts of omissions of the Purchaser, acts of civil or military authorities, government regulations or priorities, fires, floods, epidemics, quarantine, inability to obtain necessary labor, war, riots, strikes, differences with workmen, accidents to machinery, delays in transportation, failure of or delay in furnishing correct or complete information by Purchaser, impossibility or impracticability of performance or any other cause or causes beyond the control of Raven.

7. SHIPMENT – Unless otherwise specified in this or other documents forming a part of this contract, all shipments will be F.O.B. Raven manufacturing facility. Property of and title to the equipment shall pass to the purchaser upon delivery thereof by Raven to the carrier, and risk of loss, damage or deterioration to the equipment shall thereafter be on the purchaser. If the purchaser requests Raven to postpone shipment beyond the time Raven would be required to ship in order to comply with the delivery dates agreed upon between Raven and the purchaser elsewhere in this or other documents forming a part of this contract, (a) the purchaser shall pay Raven for the expense of storing the equipment, (b) the risk of loss, damage or deterioration to the equipment shall be on the purchaser on and from the date Raven receives the purchasers request to postpone shipment.

8. SHORTAGES – Claims for shortages, damaged, or incorrect material must be made within ten (10) days after receipt of goods.

9. MINIMUM BILLING CHARGE – Orders amounting to less than $50.00 will be billed at $50.00.

10. ACCEPTANCE OF ORDER – All orders are subject to acceptance and approval by a principle officer of Raven.

11. TITLE (Risk of loss) – The purchaser agrees that Raven shall have a security interest in the equipment purchased until paid in full. The purchaser agrees to perform all acts necessary to protect the interests of Raven in the product until such interests are discharged by payment in full. Risk of loss of the equipment or any part of the same shall pass to the purchaser upon delivery of such equipment or parts, F.O.B. Raven's manufacturing facility.

12. CANCELLATIONS – An order once placed with and accepted by Raven can be canceled only with Raven's consent and upon terms which indemnify Raven against loss.

13. WARRANTY – This warranty expressly precludes any liability by Raven for consequential damages however arising after delivery to the purchaser of the affected equipment, and is limited to the expressed warranty, excluding all implied warranties including merchantability. All equipment manufactured by Raven is warranted against defective materials and workmanship for a period of two (2) years from the date of delivery to the original purchaser. Liability under this warranty is limited to servicing, adjusting, repairing or replacing, as necessary, any equipment returned to the factory, transportation prepaid for that purpose. Factory examination must disclose a manufacturing defect. Repaired or replaced items will be returned to the purchaser surface freight prepaid within the continental U.S.A.

This warranty does not extend to any equipment which has been subjected to transportation damage, misuse, neglect, accident, improper installation, or any other circumstances reasonably beyond the control of Raven. Repairs will be billed to the purchaser at cost. In such cases, an estimate will be submitted for approval before repair is initiated. Repaired equipment will be returned to the purchaser with transportation charges collect, unless otherwise agreed to between the purchaser and Raven.

14. RETURN FOR CREDIT – No equipment may be returned for credit until the company has obtained Raven's written approval for return authorization. Materials accepted for return is subject to a re-stocking charge of 15% of the current list price. All transportation charges will be borne by the purchaser. Orders for special non-stock equipment or items become non-cancelable upon initiation of production and are not returnable for credit.

15. RETURNS FOR REPAIR – Equipment returned for repair should be identified with a tag indicating the problem, and returned to Raven's repair service department. Special instructions, i.e., desired modifications, should be noted on the packing slip. Any equipment returned must be packaged to insure safe arrival at Raven. Items modified and/or programmed by customer for special features will be returned to standard Raven configuration, with time billed accordingly, unless modification and/or program instructions or documentation is provided and repairs have been agreed to by Raven.

16. SERVICE – Engineering assistance will be provided on request for permanently installed equipment, and billed at a nominal fee as agreed upon between Raven and the purchaser.

17. APPLICABLE LAW – The validity, performance, construction and interpretation of these terms and conditions shall be governed by the laws of the state of Nevada, United States of America and any litigation must take place in the state of Nevada.

18. PROPRIETARY DATA – Raven retains ownership and rights in all proprietary data disclosed to the purchaser by Raven in connection with this contract. Proprietary samples, software documents and/or drawings shall not be disclosed, reproduced, manufactured or made available to unauthorized persons in whole or in part or used to prepare the same or similar materials without the expressed written permission from Raven. Proprietary data includes all design, engineering, and technical information (whether patentable or not) and other information concerning Raven trade secrets not disclosed by inspection or analysis of the equipment itself.

19. GOVERNMENT REQUIREMENTS – Raven agrees to comply with all applicable state and federal laws, rules and regulations, and all obligations hereunder are subject to applicable government regulation, including those affecting or limiting prices (except price redetermination), production, purchases, sales, use or inventory of materials. If the equipment to be furnished is to the United States government, Raven agrees to comply with applicable requirements for such contracts, with respect to secrecy, use of convict labor, employment of aliens, non-discrimination, plant protection, espionage, sabotage, fair labor standards act of 1938, as amended, the service contract act of 1965 as amended and other provisions relative to hours and conditions of work, if and when applicable.

20. MODIFICATION AND SUBSTITUTION – Raven reserves the right to modify equipment of Raven design sold hereunder, and/or the drawings and specification related thereto, or to substitute equipment of later design to fulfill this contract, providing the modification or substitution will not materially affect the performance of the equipment or lessen in any way the utility of the equipment to the purchaser.

21. DESIGN CHANGES – Raven reserves the right to make design changes at any time without incurring any obligation to modify equipment previously sold.

22. TERMS AND CONDITIONS – The terms and conditions specified herein shall be in addition to those set out in the Raven proposal.

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